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Abstract

**REACTOR SM-2 WITH THE HIGHEST AVAILABLE
NEUTRON FLUX**

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The paper describes the main experiments conducted to ascertain separate parameters of the SM-2 reactor and also some problems of its operation. The experimental results obtained are compared with the theoretical calculations. Some design changes made in the period of adjustment and operation of the reactor are also described.

The following questions are discussed in the paper:

1) dependence between the critical charge of the reactor and the configuration of the core; 2) change in reactivity as the uranium-235 burns out; 3) change in reactivity after the replacement of burnt-up fuel units by fresh ones; 4) control rod effectiveness; 5) neutron spectrum; 6) slow-neutron distribution throughout the reactor volume; 7) effects of various materials placed in the central cavity and other vertical channels on reactivity and slow-neutron distribution; 8) poisoning, etc.

Experiments were conducted both in the reactor and on a special physical stand. Critical experiments were mainly carried out on the stand. The neutron spectrum was studied with the aid of special small-size pulse chambers containing uranium-235, as well as uranium, indium and other tracers. The unevenness in power release depending on the core height was measured according to the residual gamma-activity of the fuel ele-

ments.

Physical calculations were made in various approximations. The spectrum of slowing-down neutrons and the volume distribution of various-energy neutrons were calculated in P_1 -approximation. Calculations connected with the determination of critical dimensions, change in reactivity as the uranium-235 burnt out and after the reloading of fuel assemblies, volume slow neutron distribution, etc., were made in two-group two-dimensional approximation. The slow-neutron spectrum was calculated for a homogeneous medium. The results of the calculations on the whole satisfactorily agree with the experiments.

The authors describe their experience in operating some engineering assemblies of the reactor: system of protection control, the reloading machine, etc. Some data on the stability of some construction materials are given. Experience in operating the reactor made it possible to ascertain which of the units in the reactor design are more or less good. In particular, the fuel elements proved to be quite good.

The reactor showed the following characteristics:

1. Power capacity - 50,000 kW.
2. Thermal neutron flux in the "neutron trap" - $(2.5 \pm 0.5) \cdot 10^{15}$ n/cm².sec.
3. Fast neutron flux with an energy of more than 1 Mev. in the core-about 10^{15} n/cm².sec.
4. Maximal thermal loads on the surface of fuel elements- $6 \cdot 10^6$ k cal/m².hour.
5. Maximal thermal load per unit volume of the core- $4.5 \cdot 10^3$ kW/l.